PERMIT BOILERPLATE FOR SMALL
GAS- AND/OR DISTILLATE OIL-FIRED BOILERS

I. PURPOSE

To specify requirements for permit approval for distillate (including diesel) oil-fired boilers having a heat input capacity from 10 through 100 x 10^6 Btu/hr and gas-fired boilers having a heat input capacity from 50 through 100 x 10^6 Btu/hr. This boilerplate may not apply to boilers subject to Prevention of Significant Deterioration or Nonattainment permit review. Additional details concerning applicability are given in Section VI.A.

The boilerplate is meant to provide a guideline for the minimum requirements of the Department of Environmental Quality. More stringent requirements may be imposed if necessary to demonstrate compliance with NAAQS or other special requirements.

II. REFERENCES

Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution; Part V, Rules 5-1 (9 VAC 5-50-60 et seq.) through 5-5 (9 VAC 5-50-400 et seq.); Part VIII, 9 VAC 5-80-10; 40 CFR 60.40c through 60.48c (NSPS, Subpart Dc), American Society for Testing and Materials (ASTM) Standards D396, "Standard Specification for Fuel Oils", D975, "Standard Specifications for Diesel Fuel Oils", and D1835-86, "Standard Specification for Liquefied Petroleum Gases".

III. DEFINITIONS

The following definitions are for use in this guideline and do not necessarily have the same meaning in other portions of the regulations.

boiler - a steam generating unit that combusts fuel by external combustion to produce steam or to heat any medium.

distillate oil - fuel oil (including diesel oil) that complies with the specifications for fuel numbers 1 or 2 as defined by the American Society for Testing and Materials in ASTM D396. This definition does not include number 4 oil nor does it include used or waste oil. Although diesel oil has its own ASTM specification, numbers 1 and 2 diesel oil also meet the specifications for numbers 1 and 2 fuel oil and should be considered as such.

construction - fabrication or assembly of a new emissions unit. The definition of construction under NSPS Subpart Dc includes "installation".

installation - connecting and making an emissions unit that has previously been assembled at another location ready for use at the location of its intended use.

liquid petroleum gas - petroleum gas, including butane and propane, as defined by the American Society for Testing and Materials in ASTM D1835-86.

CEMS - continuous emissions monitoring system

COMS - continuous opacity monitoring system

modification - see the definition of "modification" under 9 VAC 5-80-10 B.3. of State Regulations.

natural gas - (1) a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in geologic formations beneath the earth's surface, of which the principal constituent is methane, or (2)

liquefied petroleum (LP) gas, as defined by the American Society for Testing and Materials in ASTM D1835-86, "Standard Specification for Liquefied Petroleum Gases". This definition does not include synthetic gases.

process heater - a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst.

reconstruction - the replacement of an emissions unit or its components to such an extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital costs required to construct a comparable, entirely new unit.

relocation - installation of an emissions unit that has been in service at another off-site location.

steam generating unit - a device that combusts any fuel and produces steam or heats water or any other heat transfer medium. This term includes any duct burner that combusts fuel and is part of a combined cycle system. This term does not include process heaters.

IV. FUEL QUALITY SPECIFICATIONS

A. Heat Content

Unless otherwise documented by the applicant, the following average heat content values for fuels may be used to calculate conservative estimates of emissions:

natural gas:	1,000 Btu/ft^3
liquid petroleum gas (butane):	97,000 Btu/gal
liquid petroleum gas (propane):	90,000 Btu/gal
#1 distillate oil (including: #1 diesel oil)	134,000 Btu/gal
#2 distillate oil (including: #2 diesel oil)	138,000 Btu/gal

B. Density

Unless documented by the applicant, the following fuel densities may be used to calculate conservative estimates of emissions:

natural gas:	0.042 lb/ft^3
liquid petroleum gas (butane):	4.84 lb/gal
liquid petroleum gas (propane):	4.24 lb/gal
#1 distillate oil (including: #1 diesel oil)	6.79 lb/gal
#2 distillate oil (including: #2 diesel oil)	7.05 lb/gal

C. Fuel Sulfur Content

Unless specified and documented by specific analyses, the following sulfur content values may

be used to calculate conservative estimates of emissions:

liquid petroleum gas (butane):	0.014 %*
liquid petroleum gas (propane):	0.0185 %*
#1 and #2 distillate oil: (including #1 and #2 diesel oil)	0.5 %*
#1 and #2 low sulfur diesel	0.05 %*

*Maximum based on ASTM standards

V. EMISSIONS CALCULATIONS

Unless specified and well documented by the applicant, the most recent AP-42 emission factors shall be used to calculate uncontrolled emissions. The current AP-42 emission factors for industrial boilers (1998) can be found in the spreadsheet at K:\agency\dte\permast\dorong.wk4.

VI. REQUIREMENTS

A. Permitting Applicability

This boilerplate applies to construction, reconstruction, installation, modification, or relocation of boilers fired by distillate oil having a heat input capability from 10 x 10^6 Btu/hr through 100 x 10^6 Btu/hr and boilers fired by natural gas and liquid petroleum gas having a heat input capacity from 50 x 10^6 Btu/hr through 100 x 10^6 Btu/hr.

Please note that units firing gaseous fuels only (including back-up fuel) and having a heat input capability of less than 50 x 10^6 Btu/hr are exempt from all permit requirements by 9 VAC 5-80-11 of State Regulations. However, these units are subject to NSPS Subpart Dc requirements, registration (9 VAC 5-20-160), and other state requirements (ie., malfunction reporting, visible emission standard).

Although boilers fired by gaseous fuels only and having a heat input capability of less than 50 x 10^6 Btu/hr are exempted by 9 VAC 5-80-11, PSD permitting requirements may apply. For PSD major sources, the reviewer should verify that any emission increases are less than significance levels and review impacts on Class I areas if within 10 km. In the event that PSD permitting is triggered, the reviewer is reminded that this boilerplate procedure is not intended to address PSD modifications. If PSD applies, the boilerplate would not be directly applicable but may be used as a guideline for the PSD permit. Likewise, the reviewer should consider the effect of PTE from unpermitted units in cases where Title V applicability could be triggered.

B. NSPS Subpart Dc Applicability

NSPS Subpart Dc applies to boilers fired by gas and/or distillate oil for which construction, reconstruction, installation, modification, or relocation commenced after June 9, 1989 and that have a heat input capability from 10 x 10^6 Btu/hr through 100 x 10^6 Btu/hr. Gas-fired units that have a heat input capability from 10 x 10^6 Btu/hr through 50 x 10^6 Btu/hr are subject to NSPS Subpart Dc notification and record keeping requirements even though these units are exempt from state permitting. An exemption letter which informs the facility of these requirements has been included as Attachment B and can be found in K:\agency\dte\permast\exmptng.ltr.

Emissions requirements in this boilerplate are at least as stringent as NSPS Subpart Dc.

C. Permit Limits

1. While current procedure is to establish permit limits for emissions greater than or equal to 0.5 tons/yr, this procedure is under review and is subject to change. However, permit limits are necessary for each criteria pollutant when:

   a. There is an underlying standard. For example, in the Emission Standards for Fuel Burning Equipment, Rule 4-8, there are emission standards for particulate matter and SO_2. Therefore, permit limits should be established for particulate matter and SO_2.

   b. The limit is part of a BACT determination. For example, if low NO_x burners are required as part of a BACT determination then a permit limit for NO_x may be required.

   c. There is an air quality issue. For example, if modeling has indicated a limit is needed to meet a NAAQS then a permit limit may be necessary for that pollutant.

2. For units capable of burning both gas and distillate oil, lbs/hr limits are based on the higher emission rate of the fuels combusted. Separate emission rates are not necessary for each fuel. TSP, PM-10, SO_2, and NO_x emission rates are generally higher when burning distillate oil**.** VOC and CO emissions are generally higher for gaseous fuels. However, it is recommended that the Environmental Engineer perform emissions calculations to confirm this assumption.

   Annual emissions limits in tons/yr are based on the permitted combination of fuel that produces the highest emission rate. An example is given in Attachment A.

3. Emission limits in lbs/10^6 Btu are not necessary for distillate oil- and gas-fired units.

D. Sulfur Dioxide

Distillate oil-fired units must burn oil with a sulfur content not to exceed 0.5 percent by weight.

E. Other Criteria Pollutants

Emission limits for other criteria pollutants are calculated based on the emission factors on the attached spreadsheet. Credit for low NO_x burners can be given if documented by the permittee. A condition can be added to the permit which requires the use of low NO_x burners, if applicable.

F. Opacity

Visible emissions shall not exceed 10 percent opacity except during one six-minute period in

any one hour in which visible emissions shall not exceed 20 percent opacity. This condition applies at all times except during start-up, shutdown, or malfunction. This is more stringent than NSPS Subpart Dc.

G. Toxic Pollutants

A spreadsheet for toxic pollutants for natural gas, distillate oil, and residual oil-fired units using the emission factors from AP-42 (1998) can be found in the spreadsheet at K:\agency\dte\permast\dorong.wk4. For natural gas units up to 100 x 10^6 Btu/hr, all toxic pollutants are exempt. For distillate oil units up to 100 x 10^6 Btu/hr, all toxic pollutants are exempt except for beryllium and formaldehyde. For beryllium, units smaller than 23 x 10^6 Btu/hr are exempt. For formaldehyde, units smaller than 90 x 10^6 Btu/hr are exempt. Toxic pollutant evaluation and permit requirements should follow current toxics procedure.

H. Fuel Sulfur Content

All liquid petroleum gas and distillate oil-fired units are required to burn fuel having a maximum sulfur content of that given in Section IV.C.

I. Fuel Sampling

1. No fuel sampling is necessary for gaseous fuels.

2. a. No fuel sampling is necessary for distillate oil. However, the permittee must obtain a "fuel supplier certification" for each shipment that includes the name of the oil supplier and a statement that the oil complies with the specifications for fuel oil numbers 1 or 2, as defined by ASTM D396-78. Inclusion of the maximum sulfur content of the fuel on the certification is optional, but should be required when permittee has requested distillate sulfur content limits of less than 0.5%.

b. If desired, the permittee may request relief for the fuel supplier's sulfur test method required by ASTM D396-78 by written request to EPA Region III.

J. Emissions Monitoring (CEMS & COMS)

Emissions monitoring is not necessary for natural gas-or distillate oil-fired units.

K. Emissions Testing

1. A three-hour opacity test is required for all oil-fired units <u>having a heat input capability of greater than or equal to 30 x 10^6 Btu/hr</u>. The test is usually to be performed by an independent testing consultant within 60 days after achieving maximum operation but no later than 180 days after initial start-up. Testing must be done while the unit is firing oil. Test results are to be submitted within 45 days after test completion to the regional office and to EPA Region III.

2. An opacity test is optional for gas-fired units <u>and oil-fired units having less than 30 x 10^6 Btu/hr heat input capability</u>. If required, it is the discretion of the Region whether a formal opacity test is required as for oil-fired units, or whether a simple opacity test may

be done by the Regional staff.

3. Emissions testing for other pollutants is not usually required for gas- and distillate oil-fired units.

L. Training, Operation, and Maintenance

All boiler operators must receive training in the operation of the boiler. Training shall consist of review and familiarization of the manufacturer's operating instructions, at minimum. In addition, the permittee must maintain operating procedures which are available on site. These procedures shall be based on the manufacturer's recommendations, at minimum.

M. Notification

1. The owner or operator must submit notification of the following:

a. the date of commencement of construction or reconstruction, (In 40 CFR 60.7 (a)(1), Notification and Record Keeping, the commence construction date is not required for mass-produced facilities which are purchased in completed form, therefore this requirement can be optional especially if the unit has already been installed.)

b. the anticipated date of start-up,

c. the actual date of start-up, and

d. the anticipated date of opacity tests, if required.

Each notification shall be submitted to the Regional Office with copies mailed to the NSPS Coordinator, EPA Region III.

Note: NSPS Subpart Dc requires that notification of the actual start-up date for distillate oil-fired boilers include the design heat input capacity of the unit, the type of fuel to be combusted, and the expected annual capacity factor for each individual fuel fired. However, this information is included in the permit which is sent to EPA Region III, and it is agency procedure that such notification is redundant. Thus, additional notification is not required.

3. The owner or operator of all facilities must notify the Department of any malfunction causing excess emissions for more than one hour. This notification shall be made by facsimile transmission, telephone, or telegraph within four business hours of the occurrence. Written notification shall be required within 14 days which includes all pertinent facts, including the estimated duration of the breakdown.

N. Record Keeping

1. All facilities operating distillate oil- or gas-fired units must maintain the following records on site:

a. a statement of the time place, and nature of training provided to each boiler operator,

b. a boiler operating procedure, and

c. records of fuel consumption specifying each fuel consumed. For NSPS, records must be kept on a daily basis on each boiler. On a case by case basis, EPA may approve less frequent reporting of fuel consumption (monthly) for gas and low sulfur distillate oil. The permittee should make the request to EPA, Region III.

2. All facilities operating distillate oil-fired units must keep fuel supplier certifications on site and current for the most recent two years.

O. Reporting

All facilities operating distillate oil-fired units shall submit quarterly SO_2 emissions reports to the Department. If distillate oil was received during the calendar quarter, each quarterly report shall include items a, b, and c listed below. If no shipments of distillate oil were received during the calendar quarter, the quarterly report shall include item a as listed below and a statement that no oil was received during the calendar quarter.

1. the dates included in the calendar quarter,

2. copies of all fuel supplier certifications or a quarterly summary of all oil shipment from each fuel supplier, and

3. a signed statement from owner or operator that the fuel supplier certifications represent all of the fuel burned in the unit.

P. Modeling

Modeling is to be done by approved agency guidelines. For units firing distillate oil, the critical impact is usually SO_2 on a 24-hour average. For units firing gas, the annual NO_x impact is usually critical.

Q. Permit Approval

In accordance with the current Delegations of Authority Memorandum, approval authority has been delegated to the Regional Office. The Regional Permit Manager may sign for the Executive Director.

ATTACHMENT A
CALCULATION OF PERMIT LIMITS FOR MULTIPLE FUELS

Example:

An applicant proposes to install a 13.8 x 10^6 Btu/hr boiler and requests the following.

Maximum #2 oil consumption:	100 gallons/hr
	500,000 gallons/yr
Equivalent operation on oil:	5000 hours/yr
Maximum gas consumption:	13,800 ft^3/hr
	69 x 10^6 ft^3/yr
Equivalent operation on gas:	5000 hours/yr

Toxic Pollutants

Because the unit has a heat input capacity of less than 23 x 10^6 Btu/hr, emissions of all toxic pollutants are exempt and toxic emissions limits are not necessary.

Criteria Pollutants

Based on the assumed emission factors and fuel characteristics in Sections III and IV and the NSPS standard for SO_2, short term emissions are calculated as follows.

TSP

distillate oil:

0.1 x 10^3 gal/hr x 2.0 lbs/10^3 gals = 0.20 lbs/hr

natural gas:

0.0138 x 10^6 ft^3/hr x 7.6 lbs/10^6 ft^3 x = 0.10 lbs/hr

worst case fuel: distillate oil

PM-10

distillate oil:

0.1 x 10^3 gal/hr x 1.0 lbs/10^3 gals = 0.10 lbs/hr

natural gas:

0.0138 x 10^6 ft^3/hr x 7.6 lbs/10^6 ft^3 = 0.10 lbs/hr

worst case fuel: distillate oil/natural gas

SO_2

distillate oil:

0.1 x 10^3 gal/hr x 142 x (0.5%S) lbs/10^3 gals = 7.1 lbs/hr

natural gas:

0.0138 x 10^6 ft^3/hr x 0.6 lbs/10^6 ft^3 = 0.008 lbs/hr

worst case fuel: distillate oil

NO_x

distillate oil:

0.1 x 10^3 gal/hr x 20.0 lbs/10^3 gals = 2.00 lbs/hr

natural gas:

0.0138 x 10^6 ft^3/hr x 100.0 lbs/10^6 ft^3 = 1.38 lbs/hr

worst case fuel: distillate oil

CO
distillate oil:
0.1 x 10^3 gal/hr x 5.0 lbs/10^3 gals = 0.50 lbs/hr
natural gas:
0.0138 x 10^6 ft^3/hr x 84.0 lbs/10^6 ft^3 = 01.16 lbs/hr
worst case fuel: natural gas

VOC
distillate oil:
0.1 x 10^3 gal/hr x 0.20 lbs/10^3 gals = 0.02 lbs/hr
natural gas:
0.0138 x 10^6 ft^3/hr x 5.5 lbs/10^6 ft^3 = 0.08 lbs/hr
worst case fuel: natural gas

Lead
natural gas: assumed negligible
distillate oil: assumed negligible
worst case fuel: not applicable

Calculation of annual emissions may be a bit more difficult. Obviously, the applicant cannot burn distillate oil for 5000 hours and natural gas for 5000 hours in the same year. He can, however, burn 5000 hours of gas or 5000 hours of distillate oil in any one year. Therefore it is feasible to write a permit limit that allows the consumption of both 500,000 gallons of oil (5000 hours) and 69 x 10^6 ft^3 of gas (5000 hours) per year. By limiting the hourly rated capacity of the boiler, the Department has a means of ensuring that both 500,000 gallons oil and 69 x 10^6 ft^3 of gas are not burned in the same year.

Under these conditions, the annual emissions limit must be based on the worst case annual emissions. In this example, the worst-case TSP, PM-10, SO_2, and No_x emissions occur while the boiler operating at full load for 5000 hours (500,000 gals/yr) on distillate oil and the remainder of the year, 3760 hours (51.9 x 10^6 ft^3/yr), on natural gas. Worst case CO and VOC emissions occur when the boiler is operating at full load for 5000 hours (69 x 10^6 ft^3/yr) on natural gas and for 3760 hours (376,000 gals/yr) on distillate oil.

In general, a boiler emits more TSP, PM-10, and SO_2 while burning oil and more VOC while burning gas. CO and NO_x may be higher for either fuel. In any case, calculations should be done to determine the worst-case fuel.

Annual emissions are calculated as follows:
TSP
distillate oil:
500 x 10^3 gal/yr x 2.0 lbs/10^3 gals / 2000 lbs/ton = 0.50 tons/yr
natural gas:
51.9 x 10^6 ft^3/yr x 7.6 lbs/10^6 ft^3 / 2000 lbs/ton = 0.20 tons/yr
total:
0.50 + 0.20 = 0.70 tons/yr

PM-10
distillate oil:

500 x 10^3 gal/yr x 1.0 lbs/10^3 gals / 2000 lbs/ton = 0.25 tons/yr

natural gas:

51.9 x 10^6 ft^3/yr x 7.6 lbs/10^6 ft^3 / 2000 lbs/ton = 0.20 tons/yr

total:

0.25 + 0.20 = 0.45 tons/yr

$\underline{SO_2}$

distillate oil:

500 x 10^3 gal/yr x 142 (0.5 %S) lbs/10^3 gal / 2000 lbs/ton = 17.75 tons/yr

natural gas:

51.9 x 10^6 ft^3/yr x 0.6 lbs/10^6 ft^3 / 2000 lbs/ton = 0.02 tons/yr

total:

17.75 + 0.02 = 17.77 tons/yr

$\underline{NO_x}$

distillate oil:

500 x 10^3 gal/yr x 20.0 lbs/10^3 gals / 2000 lbs/ton = 5.00 tons/yr

natural gas:

51.9 x 10^6 ft^3/yr x 100.0 lbs/10^6 ft^3 / 2000 lbs/ton = 2.60 tons/yr

total:

5.00 + 2.60 = 7.60 tons/yr

<u>CO</u>

natural gas:

69 x 10^6 ft^3/yr x 84 lbs/10^6 ft^3 / 2000 lbs/ton = 3.00 tons/yr

distillate oil:

376 x 10^3 gal/yr x 5.0 lbs/10^3 gals / 2000 lbs/ton = 1.25 tons/yr

total:

3.00+1.25 = 4.25 tons/yr

<u>VOC</u>

natural gas:

69 x 10^6 ft^3/yr x 5.5 lbs/10^6 ft^3 / 2000 lbs/ton = 0.19 tons/yr

distillate oil:

376 x 10^3 gal/hr x 0.20 lbs/10^3 gals / 2000 lbs/ton= 0.04 lbs/hr

total:

0.19 + 0.04 = 0.23 tons/yr

<u>Lead</u>

natural gas: assumed negligible
distillate oil: assumed negligible
total: negligible

Considering the Department's procedure of not writing permit limits for calculated criteria pollutant emissions of less than 0.5 tons/yr, the suggested permit limits are as follows.

Fuel Consumption Limits:

distillate oil: 500,000 gallons/yr
natural gas: 69 x 10^6 ft/year

Short term limits:

Pollutant	Limit	Comment
TSP	0.2 lbs/hr	based on distillate oil
PM-10	None	emissions < 0.5 tons/yr
SO_2	7.1 lbs/hr	based on distillate oil, 0.5 % sulfur
NO_x	2.0 lbs/hr	based on distillate oil
CO	1.2 lbs/hr	based on natural gas
VOC	None	emissions < 0.5 tons/yr
Lead	None	emissions < 0.5 tons/yr

Annual limits:

Pollutant	Limit	Comment
TSP	0.7 tons/yr	5000 hours oil, 3760 hours gas
PM-10	None	emissions < 0.5 tons/yr
SO_2	17.8 tons/yr	5000 hours oil, 3760 hours gas
No_x	7.6 tons/yr	5000 hours oil, 3760 hours gas
CO	4.3 tons/yr	5000 hours gas, 3760 hours oil
VOC	None	emissions < 0.5 tons/yr
Lead	None	emissions < 0.5 tons/yr

ATTACHMENT B

Name
Title
Company
Street Address
City, State zip

Location: County
Registration No: xxxxx
County-Plant No: xxx-xxxx

Re: Installation of New Boiler

Dear Name:

This will acknowledge the receipt of your application dated **date** regarding the installation of a **size** mmbtu/hr natural gas-fired boiler at your facility located in **location**, Virginia.

The natural gas-fired boiler to be installed at your facility is subject to New Source Performance Standards (NSPS) Subpart Dc. NSPS Subpart Dc applies to any steam generating unit that commences construction after June 9, 1989, and has a maximum design heat input capacity from 10 through 100 million BTU per hour. A copy of NSPS Subpart Dc has been attached for your reference. Based on the information supplied, the natural gas-fired boiler to be installed at your facility is subject only to the record keeping and reporting requirements of NSPS Subpart Dc. The reporting requirements include notification of EPA, and should be sent to the following location:

Chief
Air Enforcement Branch (3AT13)
U. S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Under State Regulations, facilities that are subject to permitting requirements solely because of NSPS applicability can be exempted from permitting requirements if the NSPS requirements are only record keeping and reporting. This unit is therefore exempt from the permitting requirements in 9 VAC 5-80-10 of the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution.

You are reminded that even though the installation of the boiler is exempt from permitting, operation of the boiler is still subject to applicable sections of the Regulations. Such applicable requirements include but are not limited to the Standard of Performance for Visible Emissions (Rule 5-1).

This exemption letter shall not relieve ****** of the responsibility to comply with all other local, state, and federal regulations.

If you have any questions concerning this matter, please contact **engineer** at (xxx) xxx-xxxx.

Sincerely,

XXXXXXXXXXXXXXXXX
Air Permit Manager

Enclosure

cc: DEQ - File
DEQ - XXXXXXXXXXXXX, Air Compliance Manager

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